(54) **Method and apparatus for displaying sign language images corresponding to text or speech.**

(57)   In order to provide an image display method
and apparatus capable of displaying images
corresponding to document data or speech
data, image data (such as sign language im-
ages) are stored in an image dictionary in mo-
tion picture form. Document data is read out
from a character information storage device (or
speech data is received), and a sign language
image corresponding to a character string of
the document data (or the speech) is selected
from the image dictionary and displayed on a
display.

FIG. 3

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The present invention relates to an image display method and apparatus for displaying images (e.g. motion pictures) corresponding to voice data or document data, and more particularly, to an image display method and apparatus capable of displaying sign language images corresponding to speech.

The addition of voice data (such as a voice, music and the like) to video images has been long performed, and an apparatus which not only reproduces video images but generates sounds related to the images is well known.

However, there has been provided no apparatus which generates and displays images corresponding to input document data, voice signals and the like. For example, the contents of a television program are, as is well known, given to deaf persons by superimposing a caption on the screen or displaying the contents of speech in sign language on a part of the screen. However, since such caption and sign language displays incur much trouble and cost in editing, they are, as matters now stand, difficult to carry out.

Furthermore, the provision of information in characters, such as a caption, requires the deaf persons to make efforts toward understanding the information and to concentrate their attention on reading the characters.

It is an object of the present invention to provide an image display method and apparatus capable of displaying images corresponding to document data or voice data.

In order to achieve the above object, according to one aspect of the present invention, there is provided an image display apparatus comprising image storage means for storing image data, storage means for storing document data, readout means for reading out document data stored in the storage means and reading out image data corresponding to a character string of the document data from the image storage means, and display means for displaying the image data read out by the readout means.

The above structure makes it possible to display images corresponding to document data.

Since document data is displayed in a character pattern together with image data, the character pattern and the image data can be ascertained in correspondence.

Since image data to be displayed may be sign language image data corresponding to a word or a phrase, an easily recognizable image can be provided.

Since image data to be displayed may be a motion picture, an easily recognizable image can be provided.

The addition of an expansion means for expanding image data allows display image data to be stored under compression, thereby taking less memory.

According to another aspect of the present invention, there is provided an image display apparatus comprising image storage means for storing image data, speech input means for inputting speech therefrom, speech recognizing means for recognizing the speech inputted from the speech input means and generating a character code string corresponding to the recognized speech, readout means for reading out image data corresponding to the character code string from the image storage means, and display means for displaying the image data read out by the readout means.

Therefore, it is possible to generate images corresponding to speech.

According to still another aspect of the present invention, there is provided an image display method comprising the steps of inputting speech and recognizing the speech, and displaying an image corresponding to the speech based on the result of the speech recognition.

Therefore, it is possible to display images corresponding to speech.

Steps may be added for inputting a video signal together with speech, and compositely displaying an image corresponding to the video signal and the image corresponding to the recognized speech.

Other objects and features of the present invention will become clear upon reading the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing the general structure of an image display apparatus according to a first embodiment of the present invention;

Fig. 2 is a flow chart explaining processing of the image display apparatus according to the first embodiment;

Fig. 3 is a block diagram showing the general structure of an image display apparatus according to a second embodiment of the preset invention;

Fig. 4 is a block diagram showing the general structure of an image display apparatus according to a third embodiment of the present invention; and

Fig. 5 is a display example of the image display apparatus according to the third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will now be described with reference to the drawings.

[Embodiment 1]

Fig. 1 is a block diagram showing the general structure of an image display apparatus according to

a first embodiment of the present invention.

Referring to Fig. 1, a CPU 1 controls the whole apparatus, and a ROM/RAM 2 comprises a ROM in which a control program of the CPU 1 and various kinds of data are stored, and a RAM which is used as a work area of the CPU 1 and temporarily stores various kinds of data therein. A direct memory access (DMA) controller (DMAC) 3 is used to input and output data by DMA in the ROM/RAM 2, between the ROM/RAM 2 and an input-output 4, or among a character information storage device 5, an image dictionary storage device 6 and an image expansion device 7. The input-output 4 controls the interface between a keyboard 10 (which is operated by an operator to input document data, commands and the like therein) and unillustrated peripheral devices. Text inputted through the input-output 4 is stored in the character information storage device 5 which stores text data in character codes and the like. The image dictionary storage device 6 stores compressed image information corresponding to character information (words, phrases and so on). The image information includes, for example, sign language images (motion pictures) corresponding to words, phrases and so on. The image expansion device 7 expands and outputs the image information compressed and stored in the image dictionary storage device 6. An image output signal processor 8 outputs the expanded image information to a display 9, such as a CRT display. Numeral 10 denotes a CPU bus.

In the above structure, character information (character codes) stored in the character information storage device 5 is read out under the control of the CPU 1, and image data stored in the image dictionary storage device 6 is accessed corresponding to the character codes. In this case, the image dictionary storage device 6 stores sign language images corresponding to the character information; that is, words read out from the character information storage device 5. The sign language images may be obtained, for example, by adding motion to images produced by computer graphics or actually photographing persons.

The image data stored in the image dictionary storage device 6 is generally compressed because of its massive amount. In order to compress the image data, for example, the standard of Comité Consultatif Internationale Télégraphique et Téléphonique H. 261, Moving Picture Image Coding Experts Group and the like for compressing motion pictures may be used. The image data corresponding to the character information is transmitted to the image expansion device 7 by the DMAC 3. The compressed image data is expanded by the image expansion device 7, converted into video signals by the image output signal processor 8 and displayed on the display 9.

A flow chart of Fig. 2 explains the above process. A control program for carrying out the process is stored in the ROM/RAM 2.

Document data or various phrases are stored in the character information storage device 5, and the process is started, for example, in response to input of a command to read out the document data from the character information storage device 5 through the keyboard 10. First, the document data is read out from the character information storage device 5 in Step S1, image data corresponding to the read document data, such as character strings, words, phrases and the like, are read out from the image dictionary storage device 6 in Step S2, and the read image data (compressed data) is outputted to the image expansion device 7 in Step S3. The correspondence between the document data and the image data is determined, for example, by reading out storage addresses of the image data corresponding to the document data with reference to a table or the like stored in the ROM/RAM 2. In Step S4, the expanded image data is displayed on the display 9.

The steps S1 to S4 are sequentially carried out for character strings, words or phrases constituting the text stored in the character information storage device 5, and obtained images (motion pictures) are sequentially displayed on the display 9, thereby allowing understanding of the text in successive sign language images.

As described above, according to the first embodiment, image data corresponding to document data (for example, sign language images corresponding to speech) can be outputted and displayed.

Furthermore, if a character pattern generator for generating a character pattern corresponding to a character code is coupled to bus 10, it is possible to display in a part of the display 9 the text stored in the character information storage device 5 in character patterns while displaying sign language images corresponding to the character patterns. This configuration makes it possible to practice sign language and ascertain which part of the text is being displayed in sign language.

[Embodiment 2]

Fig. 3 is a block diagram showing the general structure of an image display apparatus according to a second embodiment of the present invention. Components common to Fig. 1 are denoted by like numerals, and the description thereof is omitted.

Referring to Fig. 3, a voice signal inputted from a microphone input terminal 11 is amplified by an amplifier 12, inputted to a speech recognizer 13 to be recognized, and converted into a character code with reference to a speech dictionary 14. A storage device 15 stores the voice data recognized in the speech recognizer 13.

According to the above structure, the voice signal inputted from the microphone input terminal 11 is

amplified by the amplifier 12, and recognized by the speech recognizer 13. The recognized voice data is converted into character data and stored in the storage device 15. The character data stored in the storage device 15 is read out by a CPU 1a, and image data stored in an image dictionary 6 is accessed in correspondence with the read-out character data. The image data related to the character data is transmitted to an image expansion device 7 by DMA under the control of a DMAC 3 in the same manner as described above. The compressed image data is expanded by the image expansion device 7, converted into video signals by an image output signal processor 8, and displayed on a display 9.

In this case, character data is sequentially read out from the storage device 15 and image data corresponding to the read-out character data is displayed on the display 9 in the same manner as in the above flow chart of Fig. 2.

As described above, according to the second embodiment, after an input voice signal is subjected to speech recognition, an image dictionary related to the recognized voice signal (for example, a sign language image) is read out and displayed on the display, thereby making it possible to convert and display voice data into sign language images in real time.

[Embodiment 3]

Fig. 4 is a block diagram showing the general structure of an image display apparatus according to a third embodiment of the present invention. Components common to Figs. 1 and 3 are denoted by like numerals and the description thereof is omitted. Referring to Fig. 4, an input terminal 21 for inputting a video signal, a video input signal processor 22, an image composer 23 and a video output signal processor 24 are added to the structure shown in Fig. 3.

As described in the above second embodiment, a voice signal inputted from a microphone input terminal 11 is recognized and stored in a storage device 15. After that, a compressed image related to the recognized voice signal is read out from an image dictionary storage device 6. The compressed image is further expanded by an image expansion device 7, and then transmitted to the image composer 23 through the video output signal processor 24.

On the other hand, separately from the image corresponding to the voice signal, a video signal inputted from the video input terminal 21 is transmitted to the image composer 23 through the video signal input processor 22. The image composer 23 composes the inputted video signal and the image read out from the image dictionary storage device 6 (expanded), and outputs a composite on a display 9.

If speech inputted from the microphone input terminal 11 and a video signal inputted from the video input terminal 21 are in synchronization with each other in the structure shown in Fig. 4 (for example, a television program with video), since an image outputted from the video output signal processor 24 may lag behind a video signal outputted from the video input signal processor 22, a delay circuit (not shown) may be provided for delaying the video signal inputted from the video signal input terminal 21.

Fig. 5 illustrates an example of a composite image obtained in the third embodiment. Video signals inputted from the video input terminal 21 and sign language images read out from the image dictionary storage device 6 (expanded) are displayed as a composite picture on a main screen 501 and a subscreen 502 of the display 9.

As described above, according to the third embodiment of the present invention, a sign language image corresponding to speech inputted from, for example, a microphone and video signals inputted from the video input terminal 21 are displayed in composite form, and a television program or the like is displayed on the main screen 501 while displaying sign language images corresponding to the sound of the television program on the subscreen 502. Therefore, deaf persons can also enjoy the television program.

In the above embodiments, a speech synthesis device may be added for synthesizing speech inputted from the microphone input terminal 11 with information stored in the storage devices 5 and 15. In addition, a speaker or the like may be added in order to output speech as well as images at the display 9.

The present invention may be applied to a system constituted by a plurality of input and output devices, or one apparatus comprising one such device. Needless to say, the present invention may be applied to a case in which the system or the apparatus is provided with a program for carrying out the present invention.

The individual components shown in outline or designated by blocks in the Drawings are all well-known in the image display arts, and their specific construction and operation are not critical to the operation or best mode for carrying out the invention.

While the present invention has been described with respect to what is presently considered to be the preferred embodiments, it is to be understood that the disclosure is not limited to these particular embodiments. To the contrary, the present disclosure includes various modifications and equivalent arrangements included within the spirit and scope of the appended claims. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions. Features of the different embodiments described above may also be combined as desired.

Claims

1. An image display apparatus, comprising:

    image storage means for storing image data corresponding to sign language information;

    document storage means for storing document data;

    readout means for reading out document data from said document storage means, and for reading out from said image storage means image data corresponding to a character string of the document data read out from said document storage means; and

    display means for displaying the image data read out by said readout means.

2. An image display apparatus according to claim 1, further comprising:

    control means for causing said display means to display the document data read out by said readout means in a character pattern together with the image data read out by said readout means,

    wherein the image data comprises sign language image data corresponding to a word or a phrase.

3. An image display apparatus according to claim 1, wherein said display means displays image data comprising a motion picture.

4. An image display apparatus according to claim 1, wherein said display means includes expansion means for expanding the image data read out by said readout means.

5. An image display apparatus, comprising:

    image storage means for storing image data;

    speech input means for inputting speech;

    speech recognizing means for recognizing speech inputted by said speech input means, and for generating a character code string corresponding to the recognized speech;

    readout means for reading out from said image storage means image data corresponding to the character code string generated by said speech recognizing means; and

    display means for displaying the image data read out by said readout means.

6. An image display apparatus according to claim 5, wherein said display means displays image data comprising sign language image data corresponding to a word or a phrase.

7. An image display apparatus according to claim 5, wherein said display means displays image data comprising a motion picture.

8. An image display apparatus according to claim 5, wherein said display means includes expansion means for expanding the image data read out by said readout means.

9. An image display method, comprising the steps of:

    receiving and recognizing speech; and

    displaying an image corresponding to the recognized speech, the displayed image corresponding to sign language information.

10. An image display method according to claim 9, further comprising the steps of:

    receiving image information together with the received speech; and

    displaying the received image information in a character pattern with the sign language information.

11. An image display method according to claim 9, wherein the displayed image comprises sign language picture information.

12. An image display method according to claim 9, wherein the displayed image comprises sign language motion picture information.

13. An image display method according to claim 9, further comprising the steps of:

    storing image data corresponding to speech;

    reading out the stored image data in accordance with the recognized speech; and

    expanding the read-out image data prior to displaying the image.

14. An image display method according to claim 13, further comprising the steps of:

    receiving a video signal together with the speech; and

    displaying together an image of the video signal and the sign language information image.

15. An image display apparatus having the features of any combination of the preceding claims.

16. An image signal conveying images generated automatically from document or speech signals by an apparatus according to any preceding claim.

17. A record carrier conveying images generated, automatically in response to document and/or speech data, by an apparatus according to any of claims 1 to 15.
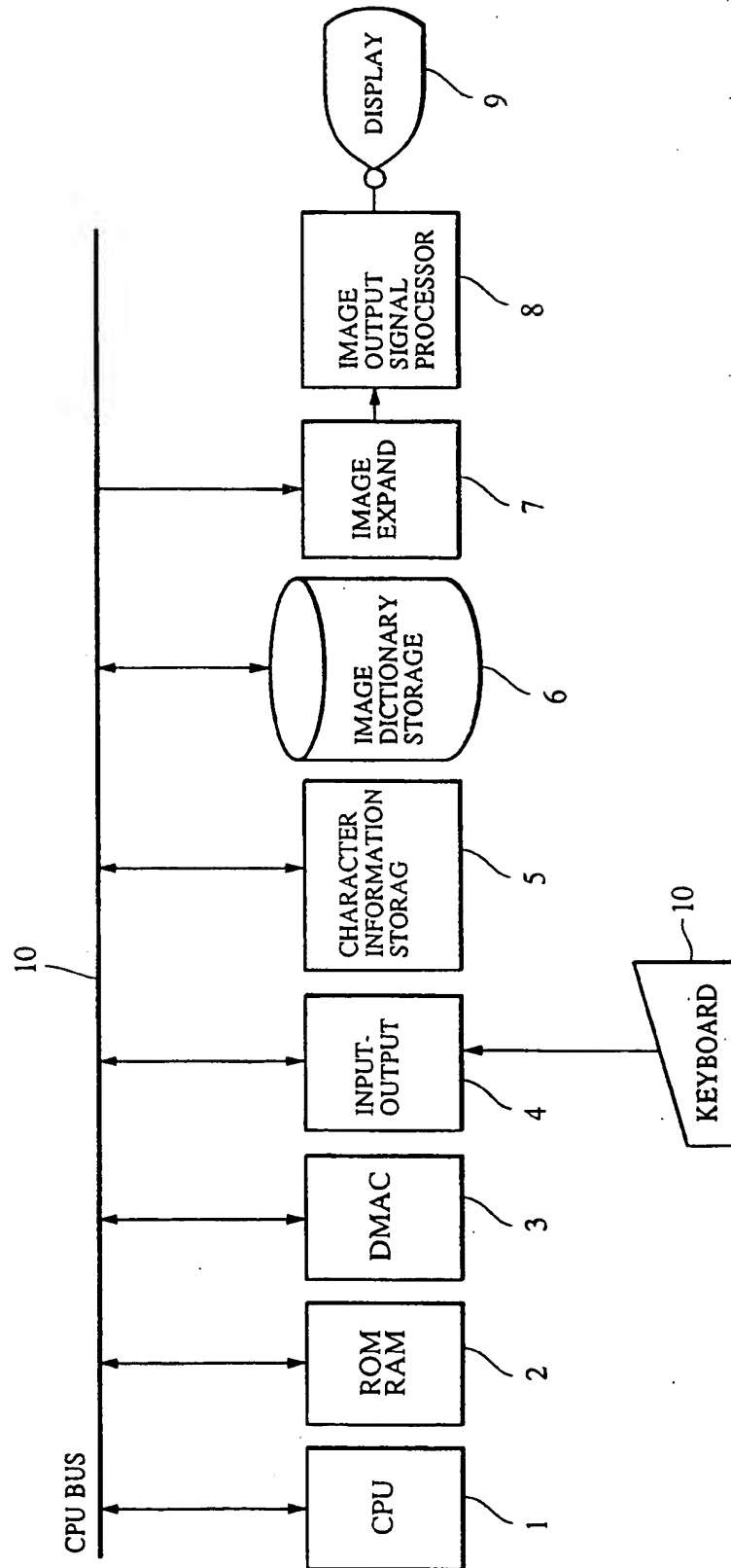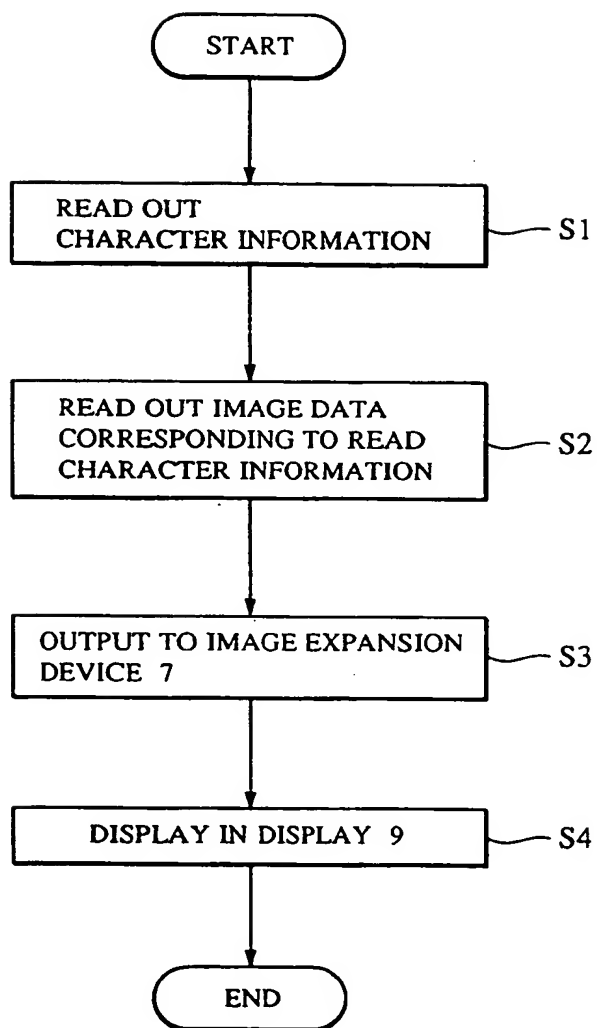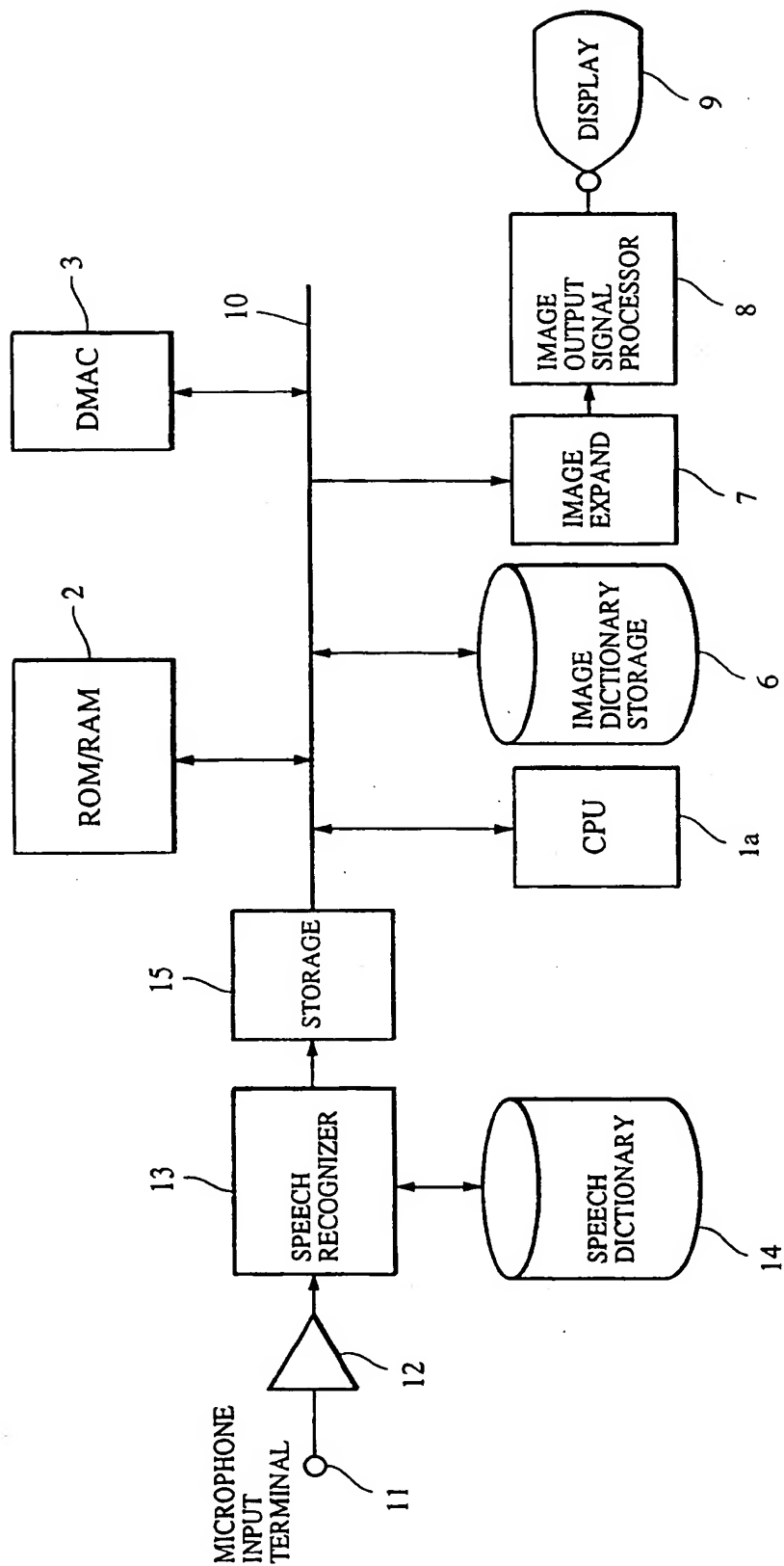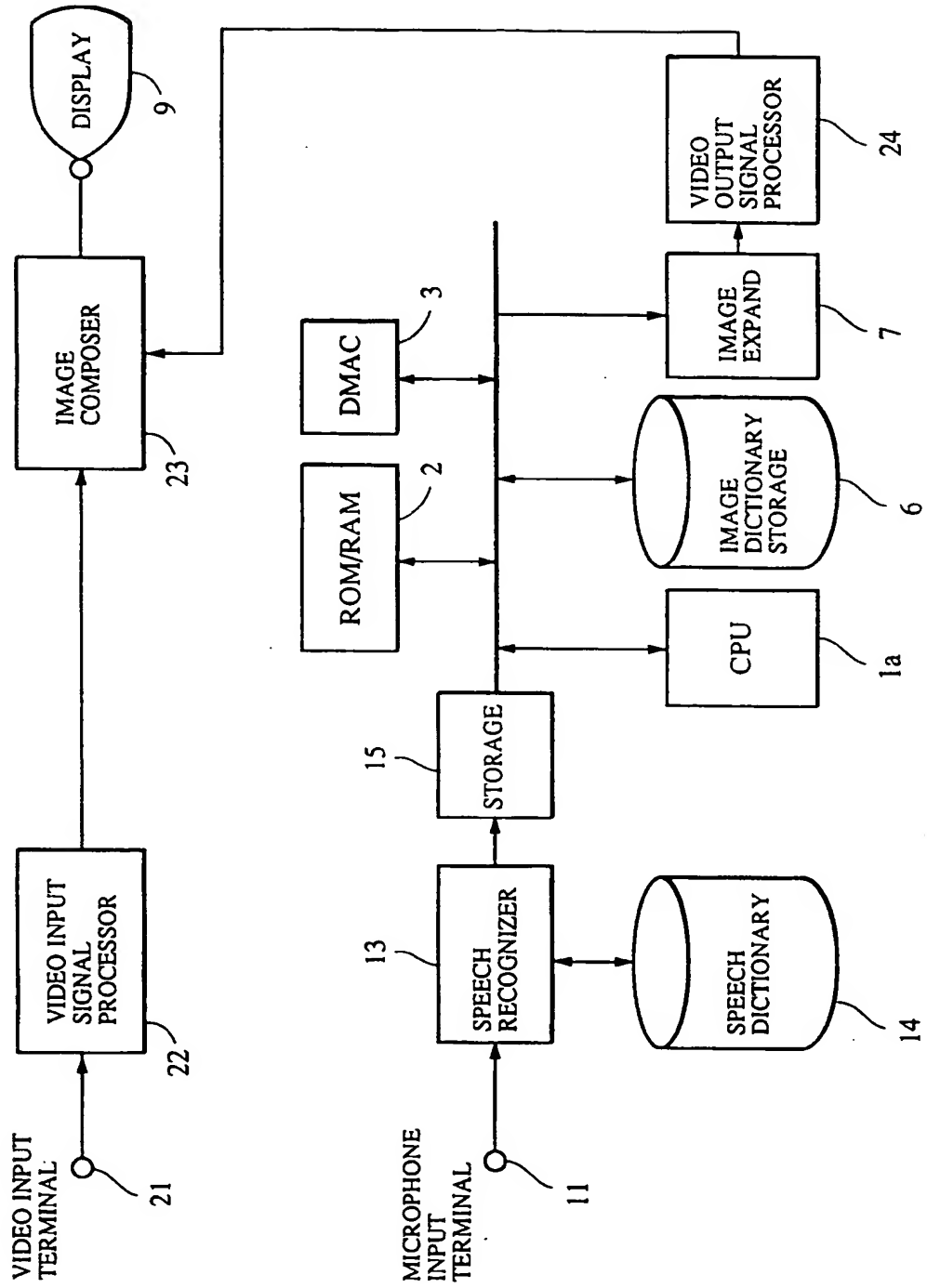
FIG. 1

FIG. 2
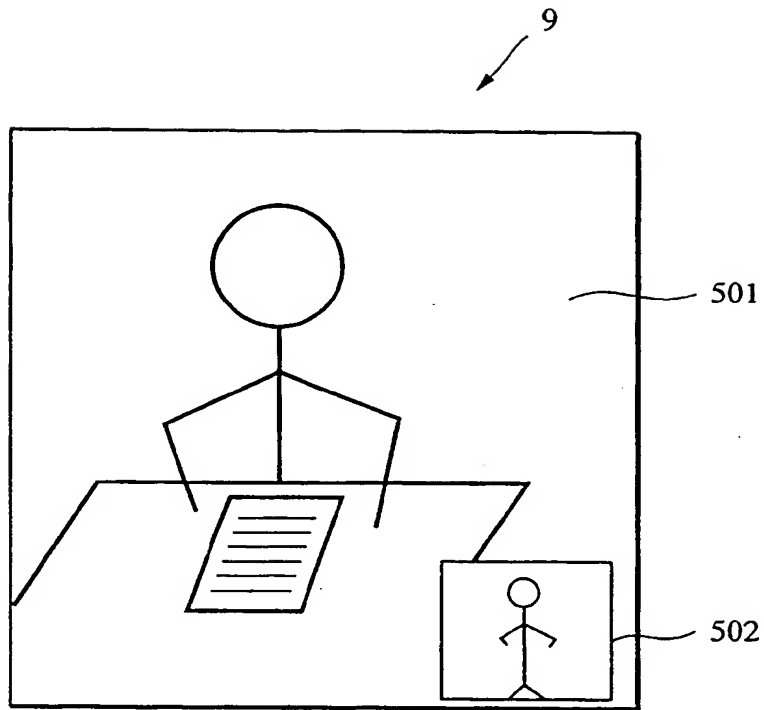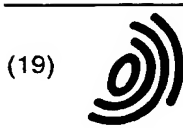
```
        ┌──────────┐
        │  START   │
        └──────────┘
              │
              ▼
  ┌──────────────────────────┐
  │ READ OUT                 │──── S1
  │ CHARACTER INFORMATION    │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │ READ OUT IMAGE DATA      │
  │ CORRESPONDING TO READ    │──── S2
  │ CHARACTER INFORMATION    │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │ OUTPUT TO IMAGE EXPANSION │──── S3
  │ DEVICE 7                 │
  └──────────────────────────┘
              │
              ▼
  ┌──────────────────────────┐
  │ DISPLAY IN DISPLAY  9    │──── S4
  └──────────────────────────┘
              │
              ▼
        ┌──────────┐
        │   END    │
        └──────────┘
```

FIG. 3

FIG. 4

FIG. 5

(12) EUROPEAN PATENT APPLICATION

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(54) **Method and apparatus for displaying sign language images corresponding to text or speech**

(57)   In order to provide an image display method and apparatus capable of displaying images corresponding to document data or speech data, image data (such as sign language images) are stored in an image dictionary in motion picture form. Document data is read out from a character information storage device (or speech data is received), and a sign language image corresponding to a character string of the document data (or the speech) is selected from the image dictionary and displayed on a display.

FIG. 3

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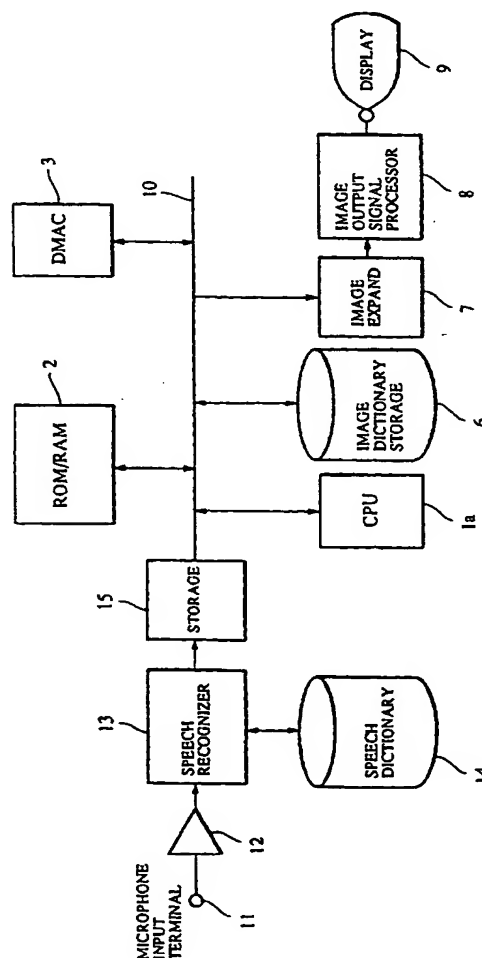
European Patent Office	EUROPEAN SEARCH REPORT	Application Number EP 94 30 9450

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATTERN RECOGNITION, 1985, UK, vol. 18, no. 3-4, ISSN 0031-3203, pages 199-205, KAWAI H ET AL 'Deaf-and-mute sign language generation system' * paragraph 4 - paragraph 6; figures *	1-9, 11-13	G06F17/28 G09B21/00
Y	---	10,14	
X	INTERCHI '93, 24 April 1993 AMSTERDAM, THE NETHERLANDS, pages 194-197, N. FRISHBERG & AL : 'Sign Language Interfaces' * page 196, column 2, line 26 - page 197, column 1, line 17 *	1-5	
A	--- IEICE TRANSACTIONS ON FUNDAMENTALS OF ELECTRONICS, COMMUNICATIONS AND COMPUTER SCIENCES, FEB. 1992, JAPAN, vol. E75-A, no. 2, ISSN 0916-8508, KUROKAWA T 'Gesture coding and a gesture dictionary for a nonverbal interface' * page 119, column 1, line 22 - column 2, line 1; figure 8 * * paragraph 5.4; figure 10 *	1-4	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G09B G06F
A	--- EP-A-0 182 460 (PROFIT TECHNOLOGY INC) 28 May 1986 * claims; figures 2,6 *	1-4	
Y	--- IBM TECHNICAL DISCLOSURE BULLETIN, vol. 34, no. 10A, 1 March 1992 page 172 XP 000302264 'REAL-TIME CLOSED-CAPTION VIDEO' * the whole document * -----	10,14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 November 1995	Fournier, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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